# Demand for Nontraditional Cookstoves in Bangladesh

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**Sector(s):** Environment & Energy, Gender

**Location:** Hatia and Jamalpur districts of Bangladesh

**Sample:** 3,079 households in 58 villages

**Target group:** Rural population Women and girls

**Outcome of interest:** Technology adoption Women's/girls' decision-making Climate change mitigation

**Intervention type:** Information Social networks Preventive health Cookstoves

**AEA RCT registration number:** AEARCTR-0001024

**Partner organization(s):** BRAC, National Science Foundation (NSF)

Indoor air pollution is the single largest environmental risk factor for female mortality, causing 5 percent of all female deaths in low- and middle-income countries. In Bangladesh, researchers evaluated how varying husband-wife dynamics, information, and prices could affect purchases of widely available "improved" stoves, which substantially reduce indoor air pollution. They found that women have stronger preferences for improved stoves than their husbands, but lack the authority to make purchasing decisions. Their findings also suggest that marketing campaigns can prompt initial adoption of unfamiliar technologies like improved stoves, but are less effective in the long run as common experience with technologies grows.

## Policy issue

One half of the world's households, and 75 percent of people in South Asia, burn biomass fuels, such as wood, leaves, dung, and peat, for energy. The smoke released from using such fuels has been shown to lead to respiratory diseases and lung cancer, which disproportionately affects women, who are primarily responsible for cooking, and the young children they are caring for. According to the World Health Organization (WHO), indoor air pollution is the single largest environmental risk factor for female mortality, causing 5 percent of all female deaths in low- and middle-income countries. In response, NGOs and governments have distributed tens of millions of "improved" or "clean" stoves, but the adoption and use of these nontraditional cookstoves in low- and middle-income countries has, with few exceptions, remained extremely low.

## Context of the evaluation

Since the early 1980s, over 100 national and local organizations have developed and attempted to distribute a variety of nontraditional cookstove models tailored to the local needs in Bangladesh. Despite such efforts, 98 percent of the population in rural Bangladesh continues to cook with traditional biomass-burning stoves. A survey conducted in 2006 suggests that women in

rural Bangladesh do not perceive indoor air pollution as a significant health hazard and subsequently prioritize other basic development needs over nontraditional cookstoves. When asked to rank the relative desirability of different attributes of nontraditional cookstoves, 47 percent of households cited the ability of nontraditional cookstoves to reduce fuel costs as their most valuable characteristic. The next most-valued attributes were the ability to reduce cooking time (21 percent) and to accommodate a wider variety of biomass fuels (14 percent). Only 9 percent of respondents answered that reducing or eliminating household smoke was the most valuable attribute.



A traditional cookstove in Bangladesh.

### Details of the intervention

In order to explore households' preferences, researchers designed two sets of overlapping experiments, both of which provided respondents an opportunity to purchase a nontraditional cookstove. In 2008, households in rural Bangladesh were randomly selected to receive basic health education about the harm of traditional cookstoves and the benefits of nontraditional cookstoves. Afterwards, they were given the opportunity to buy either an efficiency stove that improves fuel efficiency, or a chimney stove that reduces exposure to indoor smoke; the specific details of the offer varied by intervention group.

Each set of experiments was designed to evaluate the relative importance of two common explanations for the low adoption rates: (1) intrahousehold differences in preferences, and (2) lack of information from a trustworthy source about the new technology. For the first set of experiments, households were randomly assigned to one of the following intervention groups:

| Group | Stove offer | Offer recipient |
|---|---|---|
| I | Choice of free chimney or efficiency stove | Husband |
| II | Choice of free chimney or efficiency stove | Wife |
| III | Choice of BDT 250 (US$3.62) chimney or BDT 50 (US$0.72) efficiency stove | Husband |
| IV | Choice of BDT 250 (US$3.62) chimney or BDT 50 (US$0.72) efficiency stove | Wife |

A team of two enumerators visited each household. While one enumerator interviewed the male household head, the other conducted a separate interview with his wife. After completing the survey, either the husband or wife (depending on the intervention group) was given the opportunity to purchase either type of nontraditional cookstove, but was not able to consult with his/her spouse before making the decision.

The second set of experiments tested a common social marketing strategy for disseminating credible information about a new technology. Specifically, it paired random variation in prices and stove type with information about the purchase decisions of village "opinion leaders." In selected village, within each distinct neighborhood, researchers identified three opinion leaders. These opinion leaders were the first to be offered stoves, and their adoption decisions were then announced in the village. The detailed breakdown of the intervention groups was as follows:

| Group | Opinion leader | Stove offer | Price |
|---|---|---|---|
| V | No information | Choice of BDT 750 (US$11) chimney or BDT 400 (US$5.80) efficiency stove | Full |
| VI | No information | Choice of BDT 375 (US$5.43) chimney or BDT 200 (US$2.90) efficiency stove | Half |
| VII | Publicized adoption decisions | Choice of BDT 750 (US$11) chimney or BDT 400 (US$5.80) efficiency stove | Full |

| Group | Opinion leader | Stove offer | Price |
|---|---|---|---|
| VIII | Publicized adoption decisions | Choice of BDT 375 (US$5.43) chimney or BDT 200 (US$2.90) efficiency stove | Half |

Roughly four months after the orders were placed, project staff returned to deliver the cookstoves. At that time, households could refuse to install or pay for the stove.

## Results and policy lessons

*Intrahousehold differences in preferences*: Women seemed to exhibit a stronger preference than men for any improved stove, in particular for the health-saving chimney stoves. When the marketing offer was made to the wife rather than the husband, orders for the healthier chimney stove increased by 11.3 percentage points. This is consistent with the fact that the health cost of indoor smoke is greater for women. However, when a small positive price was charged for either stove, women became marginally less likely than men to order a stove. This may indicate that despite their preferences, women lack authority to make purchases.

During the initial offer, individual choices were kept hidden. However, in the intervening period between stove order and stove purchase, husbands and wives had the opportunity to learn about each other's choices and preferences, more generally. During this time period, women's choices seemed to converge with their husbands. At the final purchase stage, any gender difference in stove orders had disappeared. Again, it seems as if women could not act on their preference for improved cookstoves when their choice could subsequently be undone by their husband.

*Information dissemination*: Receiving external information from opinion leaders seemed to matter more when the costs and benefits of technology were not readily apparent. Opinion leader influence on households' purchase decisions was significantly less for chimney stoves, whose value in removing indoor smoke was apparent, than for efficiency stoves, whose combustion properties were much less obvious.

When the initial stove orders were made, there was very limited information about the new technologies available in the village except for the opinion leader purchase decisions. After orders were placed, the cookstoves were delivered over a period of several weeks and consequently, those receiving cookstoves later could learn from those who received deliveries early. Subsequently, the value of the information acquired from the opinion leaders' choices declined over time, even for efficiency stoves. These results suggest that social marketing programs which often attempt to use opinion leader influence to increase the adoption of health technologies are likely to be less effective in the long run as common experience with technologies grows.

*Price effects*: Reducing cookstove prices by 50 percent increased the number of orders and purchases of efficiency stoves by 25 and 11.6 percentage points, respectively. In contrast, orders for chimney stoves did not change significantly in response to changes in the price; the 50 percent subsidy only increased the order rate from 31.4 percent to 34.5 percent. Such marked differences in price elasticity suggest that in ordering stoves, households were less willing to trade off smoke emissions and health than they were the cook's time and fuel costs.

Miller, Grant, and A. Mushfiq Mobarak. "Learning About New Technologies Through Opinion Leaders and Social Networks: Experimental Evidence on Non-Traditional Stoves in Rural Bangladesh." Marketing Science, Forthcoming. Mobarak, Ahmed Mushfiz, Puneet Dwivedi, Robert Bailis, Lynn Hildemann, and Grant Miller. "Low Demand for Nontraditional Cookstove Technologies." Proceedings of the National Academy of Sciences (PNAS) 109(27): 10815-20. Miller, Grant, and A. Mushifq Mobarak. "Gender Differences in Preferences, Intra-Household Externalities, and the Low Demand for Improved Cookstoves." Working Paper, Stanford University, January 2013. Arif, Tamid, Anik Ashraf, Grant Miller, Ahmed Mushfiqu Mobarak, Nasima Akter, ARM Mehrab Ali, MA Quaiyum Sarkar, Lynn Hildemann, Nepal C Dey, Mizanur Rahman, Puneet Dwivedi, and Paul Wise. "Promotion of Improved Cookstove in Rural Bangladesh." Working Paper No. 22, BRAC, May 2011.